

## ABSTRACT

The present invention provides methods for preparing stable, purely synthetic, self-assembling, controlled release, polyethylene oxide (PEO)-based polymersome vesicles, and the resulting PEO-based polymersomes capable of such controlled release, and methods of use therefor for the controlled transport and delivery of encapsulatable active agents contained therein. Further provided are methods for controlling destabilization of the vesicle membrane and the resulting hydrolysis-triggered, controlled release of active agent(s) encapsulated in the vesicle by controlling the blend ratio (mol%) of hydrolysable PEO-block copolymer of the hydrophilic component(s) and of the more hydrophobic PEO-block copolymer component(s) to produce amphiphilic high molecular weight PEO-based polymersomes, wherein the PEO volume fraction ( $f_{EO}$ ) and chain chemistry control encapsulant release kinetics from the copolymer vesicles and the polymersome carrier membrane destabilization.